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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/660,920	09/13/2003	Wan Zhang	51805	7349
21874	7590	09/14/2005	EXAMINER	
EDWARDS & ANGELL, LLP P.O. BOX 55874 BOSTON, MA 02205			WONG, EDNA	
			ART UNIT	PAPER NUMBER
			1753	

DATE MAILED: 09/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/660,920

Applicant(s)

ZHANG ET AL.

Examiner

Edna Wong

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

Specification

The disclosure is objected to because of the following informalities:

page 2, line 19, the word "*mechanism*" should be amended to the word --

Mechanism --.

page 4, line 8, the word "form" should be amended to the word -- from --.

page 7, line 8, the "." (second occurrence) should be deleted.

page 8, line 27, the "." (period) should be amended to a -- , -- (comma).

Appropriate correction is required.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

I Claim 5 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is

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required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 5

line 1, the claim is dependent upon itself.

Claim Rejections - 35 USC § 112

Claims **4 and 5** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4

line 1, "the electronic device substrate" lacks antecedent basis.

Claim 17

lines 1-2, is a duplicate of claim 12.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

I. Claims **1-9 and 12** are rejected under 35 U.S.C. 103(a) as being unpatentable

over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2).

JP '100 teaches a method of electrodepositing a layer of tin or tin-alloy on a substrate, comprising:

electrolytically treating a substrate (page 1, [0002]) with a solution comprising a phosphoric acid and a carboxylic acid (page 2, [0011]).

The substrate is constructed of a copper-containing metal or metal-alloy (page 1, [0001]; and claim 1).

The substrate is constructed of copper (page 1, [0001]; and claim 1).

The electronic device substrate is a printed wiring board substrate, a lead frame, a semiconductor package, a chip capacitor, a chip resistor, a connector, or a contact (page 1, [0002]).

The carboxylic acid is malic acid, tartaric acid, citric acid, lactic acid, or a combination thereof (page 2, [0018]).

The carboxylic acid is a hydroxycarboxylic acid (page 2, [0018]).

The solution further comprises an alkali metal hydroxide (= sodium hydroxide) [pages 2-3, [0022]].

The step of electrolytically treating is conducted at a voltage effective to polish the surface of the substrate (= polishing current of 20-100 A/dm²).

The method of JP '100 differs from the instant invention because JP '100 does

not disclose the following:

a. Electrodepositing a layer of tin or tin-alloy on a surface of the treated substrate, as recited in claim 1.

JP '100 teaches forming a coating on the electropolished copper or copper alloy by electroplating which is free of surface blistering, cob and separation which was caused by generated smut (page 1, [0008]; and page 3, [0038]).

Yanada teaches that it has been common practice to perform tin plating or tin-lead alloy plating, prior to soldering, on such parts of electronic machines and equipment as chips, quartz crystal oscillators, bumps, connector pins, lead frames, hoops, lead pins of packages and printed circuit boards. The tin plating or tin-lead alloy plating imparts good solderability to various parts or forms a plating film which serves as an etching resist (col. 1, lines 13-20).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the electroplating described by JP '100 by electrodepositing a layer of tin or tin-alloy on a surface of the treated substrate because it has been common practice to perform tin plating or tin-lead alloy plating, prior to soldering, on such parts of electronic machines and equipment as chips, quartz crystal oscillators, bumps, connector pins, lead frames, hoops, lead pins of packages and printed circuit boards. The tin plating or tin-lead alloy plating would have imparted good solderability to various parts or would have formed a plating film which would have served as an etching resist as taught by Yanada (col. 1, lines 13-20).

b. Wherein the electronic device substrate is a lead frame, as recited in claim 5.

JP '100 teaches that the copper or copper alloy is made into lead material of electronic parts (page 1, [0002]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the copper or copper alloy described by JP '100 into a lead frame because a lead frame would have been encompassed by the teachings and/or would have been suggested by the lead material disclosed by JP '100 (page 1, [0002]).

A lead frame is a lead material.

c. Wherein the phosphoric acid is orthophosphoric acid present in the solution an amount of from 20 to 80% by volume, as recited in claim 6.

JP '100 teaches that the phosphoric acid radicals include an orthophosphate (page 2, [0015]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the phosphoric acid radicals described by JP '100 to orthophosphoric acid because orthophosphoric acid would have been encompassed by the teachings and/or would have been suggested by the orthophosphate disclosed by JP '100 (page 2, [0015]).

Orthophosphoric acid is an orthophosphate.

As to being present in the solution an amount of from 20 to 80% by volume, JP '100 teaches that the concentration of the phosphoric acid radicals is from 20-120 g/l (page 2, [0017]).

II. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2) as applied to claims 1-9 and 12 above, and further in view of **Baumgaertner et al.** ("Characterization of Electropolishing Baths with Electrochemical Methods", *Galvanotechnik*, Vol. 86, No. 2 (no month, 1995), pp. 376-82).

JP '100 and Yanada are as applied above and incorporated herein.

The method of JP '100 and Yanada differs from the instant invention because they do not disclose the following:

- a. Wherein the solution further comprises an organic solvent, as recited in claim 10.
- b. Wherein the organic solvent is ethylene glycol, propylene glycol, glycerin, ethanol, isopropyl alcohol, or a combination thereof, as recited in claim 11.

Baumgaertner teaches that highly efficient electropolishing both in stationary and in dynamic flow cells was observed with baths containing additives such as glycerin, higher alcohols, polyacrylamides, triazole derivatives and thiourea and its derivatives (abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method described by JP '100 and Yanada with wherein the solution further comprises an organic solvent; and wherein the organic solvent is ethylene glycol, propylene glycol, glycerin, ethanol, isopropyl alcohol, or a combination thereof because highly efficient electropolishing both in stationary and in dynamic flow cells would have been observed with baths containing such additives as taught by Baumgaertner (abstract).

III. Claims 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2).

JP '100 and Yanada are as applied for the reasons as discussed above and incorporated herein.

JP '100 also teaches electrolytically treating a substrate with a solution comprising from 50 to 80% by volume of a carboxylic acid (= 50-150 g/l) [page 2, [0019]].

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Axtell ("Electropolishing Brass", *Iron Age*, Vol. 163, No. 26 (1949), pp. 48-51) is

cited to teach an electropolishing bath for copper and bismuth-copper comprising:

41.5% H_3PO_4

24.9% glycerol

16.6% ethylene glycol

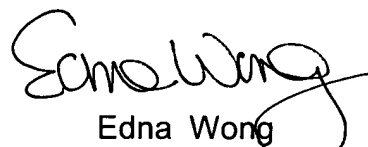
8.3% lactic acid

8.7% H_2O (abstract).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Edna Wong
Primary Examiner
Art Unit 1753

EW
September 8, 2005